Table 3-1
CURRENT YEAR SO_2 EMISSIONS FOR POWER PLANTS
Based on CEM data from EPA's Acid Rain Database

Source	1999 Actual Emissions			2000 Actual Emissions			**Current Year Emissions**	
	max 24 hour [lb/hr]	90 % 24 hour [lb/hr]	annual [TPY]	max 24 hour [lb/hr]	90 % 24 hour [lb/hr]	annual [TPY]	**2yr-90% 24 hour [lb/hr]**	**2-yr avg annual [TPY]**
Basin Electric Power Cooperative - Antelope Valley Station								
Units 1 + 2	4350	3620	15516	4940	3291	13047	**3598**	**14282**
Otter Tail - Coyote Station								
Unit 1	5799	5126	20040	5115	4655	14521	**5077**	**17281**
Great River Energy - Coal Creek								
Unit 1[1]	7744	7194	23551	5287	4195	14332	**4195**	**14332**
Unit 2[1]	7175	6891	26192	4608	3552	12817	**3552**	**12817**
PPL Corp. - Colstrip (Montana)								
Unit 3[2]	n/a	n/a	3030	n/a	n/a	2859	**672**	**2945**
Unit 4[2]	n/a	n/a	3293	n/a	n/a	2315	**640**	**2804**
Minnkota Power Cooperative - Milton R. Young Station								
Unit 1	7088	5575	19481	7082	5599	18095	**5575**	**18788**
Unit 2	7535	6161	21863	6838	6089	21134	**6128**	**21499**
Basin Electric Power Cooperative - Leland Olds Station								
Unit 1	5956	4891	16802	5970	4965	16864	**4931**	**16833**
Unit 2	11623	10282	33306	11796	9877	28587	**10179**	**30947**
Montana-Dakota Utilities Co. - Heskett Station								
Unit 1	1999 CEM data not available			537	348	1022	**348**	**1022**
Unit 2	1227	833	2208	1080	822	1778	**831**	**1993**
Great River Energy - Stanton Station								
Unit 1	3078	2371	8241	3047	2523	7017	**2456**	**7629**
Unit 10	357	327	1241	402	307	972	**320**	**1107**

[1] Current year emissions are based on year 2000 CEM data only. See discussion above.

[2] 24-hour current year emissions are based on annual CEM data divided by 365 days. See discussion

above.

No CEM data or recent emissions data were available for the two gas processing plants (Grasslands Gas and Little Knife Gas Plant) and the coal gasification plant (Greatplains Synfuels Plant), so EPA used the same emissions estimates that NDDH used in their 1999 draft study. Modeled short-term emission rates for these plants are as follows:

Grasslands Gas Plant:	273 lb/hr
Little Knife Gas Plant:	427 lb/hr
Greatplains Synfuels Plant:	3323 lb/hr

3.2 Base Year Inventory

As in the current year inventory, emissions for the base year inventory are generally based on actual emissions reflected by normal source operation for a period of 2 years. The two-year study period should generally be the two years preceding the minor source baseline date, provided that the two-year period is representative of normal source operation. Another two-year period may be used, only if that other period of time is more typical of normal source operation than the two years immediately preceding the baseline date (see 45 FR 52718). EPA rules and guidance allow the potential to emit to be used if little or no operating data are available, as in the case of a permitted emission unit constructed before the major source baseline date but not yet in operation at the time of the minor source baseline date (see 40 CFR 51.166(b)(13), p. C.11 of the PSD workshop manual and 45 FR 52718, col. 3).

Four of the seven coal-burning power plants in North Dakota commenced construction before the major source baseline date for SO_2 (January 6, 1975). These include Minnkota Power Cooperative's Milton R. Young Station (Units 1 and 2), Basin Electric Power Cooperative's LeLand Olds Station (Units 1 and 2), Montana-Dakota Utilities Company's Heskett Station (Units 1 and 2) and Great River Energy's Stanton Station (Unit 1). These units are all included in the major source base year emission inventory. No major sources in this analysis that were built before the major source baseline date reported any physical change or change in the method of operation after the major source baseline date but before the minor source baseline dates (*i.e.*, all emissions prior to the applicable minor source baseline dates are considered to be baseline emissions).

Following is a brief description of each baseline source, based on information from EPA's Acid Rain Database (see http://www.epa.gov/airmarkets/picturethis/index.htm). Operational dates are from the Lignite Energy Council website (see http://www.lignite.com/mines/index.html):

Minnkota Power Cooperative - Milton R. Young Station
Unit 1 - 257 MW, lignite-fired cyclone boiler, uncontrolled for SO_2, operational in 1970
Unit 2 - 477 MW, lignite-fired cyclone boiler, SO_2 control - (dry alkali) flue gas desulfurization, operational in 1977

Basin Electric Power Cooperative - Leland Olds Station
Unit 1 - 216 MW, lignite-fired dry bottom boiler, uncontrolled for SO_2, operational in 1966
Unit 2 - 440 MW, lignite-fired cyclone boiler, uncontrolled for SO_2, operational in 1975

Montana-Dakota Utilities Co. - Heskett Station
Unit 1 - 25 MW, lignite-fired, uncontrolled for SO_2, operational in 1954
Unit 2 - 75 MW, lignite-fired boiler retrofitted to a fluidized bed combustor in 1987, uncontrolled for SO_2, operational in 1963

Great River Energy - Stanton Station
Unit 1 - 187 MW, lignite-fired dry bottom boiler, uncontrolled for SO_2, operational in 1966

3.2.1 Base Year Inventory for North Dakota Class I Areas

In general, the base year inventory for the North Dakota class I areas is based on actual emissions averaged over the two-year period 1976-1977. For all baseline emissions we used AP-42 emission factors for uncontrolled lignite-fired boilers (see AP-42, section 1.7, Table 1.7-1).

The only data available to us for these baseline sources for the years 1976 and 1977 are what is reported to the State in the Annual Emission Inventory Reports (*e.g.*, coal use, sulfur content, coal feed rates, etc.). Based on this information, several options existed for determining the short term maximum actual emission rates needed for the modeling analysis.

One option for determining short-term emissions is to calculate an emission rate based on an AP-42 emission factor (in units of lb_{so2}/ton_{coal}) and the maximum sulfur content (wt. %) and maximum coal feed rate (ton_{coal}/hr) supplied in the Annual Emission Inventory Reports. However, we believe that the maximum coal feed rate numbers are very uncertain. We are not aware of any official method or quality assurance process that has been used to arrive at these numbers. According to the State, at least one company has questioned the accuracy of these data. For these reasons, we dismissed this option for calculating short-term emissions. In using maximum hourly feed rates and maximum sulfur content, this option would likely overpredict SO_2 emissions in the base year.

A second option for determining short-term emissions is to calculate annual emissions (based on an AP-42 emission factor (in lb_{so2}/ton_{coal}), average sulfur content (in wt. %) and annual coal usage (in ton_{coal}/yr)) and divide this number by 365 days per year to arrive at a lb per day emission rate. Since this method is based on *average* annual operation data, this option would likely underpredict SO_2 emissions in the base year. For this reason we also dismissed this option, except as a screening approach for sources with very low emission rates, or at great distances from the Class I areas.

A third option for determining short-term emissions is to calculate annual emissions (again, based on an AP-42 emission factor (in lb_{so2}/ton_{coal}), average sulfur content (in wt. %) and annual coal usage (in ton_{coal}/yr)) and then apply the peak-to-mean ratio from the current year CEM emissions to the mean annual base year emissions to get peak base year emissions.

Specifically, the ratio of the annual average emission rate from the 1999-2000 CEM data to the 90th percentile 24-hr emission rate (from 1999-2000 CEM data) is applied to the annual average emission rate in the base year to calculate the 24-hr emission rate in the base year. Since short-term emission rates in the current year inventory are based on the 90th percentile of the 24-hour average (see Section 3.1), this option would give the best estimate of the 90th percentile 24-hr emission rate in the base year and would, therefore, be consistent with the short-term emissions used in the current year inventory. For this reason we chose this option for calculating short-term SO_2 emissions in the base year.

<insert some language here on the importance of using the same methodology for determining emissions in the base year as in the current year (i.e., importance of an "apples to apples" comparison). - SARA?>

Annual average emissions (for use in option 3 above) are based on an AP-42 emission factor for uncontrolled lignite-fired boilers of 30 S (see AP-42, section 1.7, Table 1.7-1). Annual Emission Inventory Reports for each baseline source were obtained from the State of North Dakota for 1976 and 1977. From these reports, annual coal usage and average sulfur content data were used to calculate annual average SO_2 emissions. For example, annual average base year SO_2 emissions for Minnkota's Milton R Young Unit 1 are:

$$SO_2\ emissions_{1976}\,[TPY] = 30 * (0.52\%)\frac{lb_{SO2}}{ton_{coal}} * 1{,}581{,}000\frac{ton_{coal}}{yr} * \frac{1\,ton_{SO2}}{2000\,lb_{SO2}} = 12332\frac{ton_{SO2}}{yr}$$

$$SO_2\ emissions_{1977}\,[TPY] = 30 * (0.63\%)\frac{lb_{SO2}}{ton_{coal}} * 1{,}527{,}511\frac{ton_{coal}}{yr} * \frac{1\,ton_{SO2}}{2000\,lb_{SO2}} = 14435\frac{ton_{SO2}}{yr}$$

$$2yr\ average\ SO_2\ emissions\,[TPY] = \frac{(12332 + 14435)}{2} = \underline{\underline{13383\,TPY}}$$

Short-term emissions are then calculated based on the peak-to-mean ratio from current year emissions. For example, short-term SO_2 base year emissions for Minnkota's Milton R Young Unit 1 boiler are:

$$peak-to-mean\ ratio_{1999-2000} = \frac{18788\frac{ton}{yr}(2yr\ annual\ avg_{1999-2000})}{5575\frac{lb}{hr}(90^{th}\%\ 24hr\ avg_{1999-2000}) * \frac{8760\,hr}{yr} * \frac{ton}{2000\,lb}} = 1.30$$

$$base\ year\ SO_2\ emissions\left[\frac{lb}{hr}\right] = 13383\frac{ton}{yr} * 1.30 * \frac{yr}{8760\,hr} * \frac{2000\,lb}{ton} = \underline{\underline{3972\frac{lb}{hr}}}$$

For the most part we used the above method for calculating base year emissions.

However there are a few exceptions. Minnkota's Milton R Young Unit 2 had only been in operation for 9 months as of the minor source baseline date and those 9 months do not appear to be representative of normal operating conditions. The unit was apparently out of compliance with its allowable emissions for many months after the unit began operation. Considering that we do not have two years of actual emissions at the time of the minor source baseline date for this unit, as well as the fact that the unit really did not begin "normal operations" until after the baseline date was triggered, we believe it is appropriate in this situation to consider the allowable emissions of Minnkota's Unit 2 as its emissions at the time of the baseline date (see 45 FR 52718, col. 3). Furthermore, since any emissions increases above a source's allowable emission rate at the time of the minor source baseline date must be considered as increment consuming emissions, it would not be appropriate to use Unit 2's actual emission rate at the time of the minor source baseline date as the baseline emission rate. Therefore, we modeled a short-term emission rate of 5635 lb/hr (the allowable emission rate) for this unit.

The other exception in calculating baseline emissions is for Montana-Dakota Utilities Co.'s Heskett Unit 1 emissions. Since Heskett Unit 1 is not an acid rain source, no CEM emissions are reported to the Acid Rain Database. Hourly CEM data were only available for the year 2000 from the State of North Dakota. Therefore, the peak-to-mean ratio used to calculate short-term emissions in the base year is only based on year 2000 data (as opposed to both 1999 and 2000 data, used for all other baseline sources).

Baseline emissions for the Class I areas in North Dakota are summarized in Table 3.2.1-1.

Table 3-2

SO_2 BASELINE EMISSIONS FOR **NORTH DAKOTA** CLASS I AREAS

Based on AP-42 and annual emission inventory reports provided by ND for 1976-1977

SO_2 minor source baseline date = December 19, 1977

Source	Emission Factor	1976 Actual Emissions			1977 Actual Emissions			**Baseline Emissions**	
	[lb_{SO_2}/ton_{coal}]	avg. S [%]	coal burned [TPY]	annual emissions [TPY]	avg. S [%]	coal burned [TPY]	annual emissions [TPY]	**annual [TPY]**	**24-hr[1] [lb/hr]**
Minnkota Power Cooperative - Milton R. Young Station									
Unit 1	30(S)	0.52	1581000	12332	0.63	1527511	14435	**13383**	**3972**
Unit 2[2]	n/a	n/a	n/a	24682	n/a	n/a	24682	**24682**	**5635**
Basin Electric Power Cooperative - Leland Olds Station									
Unit 1	30(S)	0.45	1255995	8478	0.44	1306785	8625	**8551**	**2499**
Unit 2	30(S)	0.45	1958680	13221	0.44	1964660	12967	**13094**	**4305**
Montana-Dakota Utilities Co. - Heskett Station									
Unit 1	30(S)	0.75	159196	1791	0.68	171162	1746	**1768**	**602**

Source	Emission Factor	1976 Actual Emissions			1977 Actual Emissions			**Baseline Emissions**	
	[lb_{SO2}/ton_{coal}]	avg. S [%]	coal burned [TPY]	annual emissions [TPY]	avg. S [%]	coal burned [TPY]	annual emissions [TPY]	**annual [TPY]**	**24-hr[1] [lb/hr]**
Unit 2	30(S)	0.75	376017	4230	0.68	406145	4143	**4186**	**1749**
Great River Energy - Stanton Station									
Unit 1	30(S)	0.65	746205	7275	0.64	737106	7076	**7176**	**2310**

[1] Based on the ratio of annual average emission rate (from 1999-2000 CEM data) to the 90th percentile 24-hr emission rate (from 1999-2000 CEM data) applied to the annual average emission rate in the base year.

[2] Unit 2 had only been operating 9 months as of the minor source baseline date (12/19/77) and those 9 months were not considered representative of actual operation. Therefore, allowable emissions were used to determine baseline emissions. See 45 FR 52718, col. 3.

3.2.2 Base Year Inventory for Montana Class I Areas

In general, the base year inventory for the Montana Class I areas was compiled using the same method as for the North Dakota Class I inventory. The only difference is the use of 1977 and 1978 emission inventory data for calculating the annual average emission rates. While we still used allowable emissions for Minnkota's Milton R Young Unit 2 in 1977, we were able to calculate actual emissions for 1978. Since Unit 2 commenced construction after August 17, 1971, it was permitted according to the New Source Performance Standards (NSPS) in 40 CFR Part 60 Subpart D. Therefore, we calculated actual emissions for the unit based on this 1.2 lb_{so2}/mmBtu standard, the average heat content of the coal in 1978 and the annual coal usage rate for that year. We then applied the peak-to-mean ratio from 1999-2000 CEM data to calculate a short-term emission rate and averaged that with the 1977 allowable emission rate of 5635 lb/hr to arrive at a short-term emission rate for the unit for the base year. Other possibilities we considered for determining baseline emissions for this unit were: (1) to just use the 1978 actual numbers (not averaged with the allowable emissions for 1977); and (2) to use the allowable emission rate for both 1977 and 1978 emissions. EPA solicits comments from the public on how to determine the most representative baseline emission rate for this source.

Baseline emissions for the Class I areas in Montana are summarized in Table 3.2.2-1.

Table 3-3
SO_2 BASELINE EMISSIONS FOR MONTANA CLASS I AREAS
Based on AP-42 and annual emission inventory reports provided by ND for 1977-1978
SO_2 minor source baseline date = March 26, 1979

Source	Emission Factor [lb_{SO2}/ton_{coal}]	1977 Actual Emissions			1978 Actual Emissions			**Baseline Emissions**	
		avg. S [%]	coal burned [TPY]	annual emissions [TPY]	avg. S [%]	coal burned [TPY]	annual emissions [TPY]	**annual [TPY]**	**24-hr[1] [lb/hr]**
Minnkota Power Cooperative - Milton R. Young Station									
Unit 1	30(S)	0.63	1527511	14435	0.65	1427485	13918	**14176**	**4208**
Unit 2[2]	1.2 lb/mmBtu	n/a	n/a	24682	0.65	1956191	15087	**19884**	**4970**
Basin Electric Power Cooperative - Leland Olds Station									
Unit 1	30(S)	0.44	1306785	8625	0.74	1361539	15113	**11869**	**3469**
Unit 2	30(S)	0.44	1964660	12967	0.74	2435160	27030	**19999**	**6575**
Montana-Dakota Utilities Co. - Heskett Station									
Unit 1	30(S)	0.68	171162	1746	0.71	161755	1723	**1734**	**590**
Unit 2	30(S)	0.68	406145	4143	0.71	342560	3648	**3895**	**1628**
Great River Energy - Stanton Station									
Unit 1	30(S)	0.64	737106	7076	0.61	577004	5280	**6178**	**1989**

[1] Based on the ratio of annual average emission rate (from 1999-2000 CEM data) to the 90th percentile 24-hr emission rate (from 1999-2000 CEM data) applied to the annual average emission rate in the base year.

[2] Unit 2 had only been operating 9 months in 1977 and those 9 months were not considered representative of actual operation. Therefore, allowable emissions were used to determine 1977 emissions. See 45 FR 52718, col. 3. 1978 emissions are based on an emission limit of 1.2 lb_{SO2}/mmBtu for NSPS boilers (see 40 CFR Part 60 Subpart D) and an average heat content of 6427 Btu/lb_{coal}.

3.3 Increment Consuming Emissions

Tables 3.3-1 and 3.3-2 summarize the increment consuming emissions from the inventories in Section 3.1 (Current Year Emissions) and 3.2 (Base Year Emissions).

Table 3-4
SO_2 INCREMENT CONSUMING EMISSIONS FOR NORTH DAKOTA CLASS I AREAS

Source	Base Year Emissions		Current Year Emissions		Increment Consuming Emissions[1]	
	24-hr[2] [lb/hr]	annual [TPY]	24-hr[3] [lb/hr]	annual [TPY]	24-hour [lb/hr]	annual [TPY]
Basin Electric Power Cooperative - Antelope Valley Station						
Units 1+2	n/a	n/a	3598	14282	3598	14282
Otter Tail - Coyote Station						
Unit 1	n/a	n/a	5077	17281	5077	17381
Great River Energy - Coal Creek Station						
Unit 1[4]	n/a	n/a	4195	14332	4195	14332
Unit 2[4]	n/a	n/a	3552	12817	3552	12817
PPL Corp. - Colstrip (Montana)						
Unit 3	n/a	n/a	672	2945	672	2945
Unit 4	n/a	n/a	640	2804	640	2804
Minnkota Power Cooperative - Milton R.Young Station						
Unit 1	3972	13383	5575	18788	1603	5405
Unit 2[5]	5635	24682	6128	21499	493	-3184
Basin Electric Power Cooperative - Leland Olds Station						
Unit 1	2499	8551	4931	16833	2432	8282
Unit 2	4305	13094	10179	30947	5874	17853
Montana Dakota Utilities Co. - Heskett Station						
Unit 1[6]	602	1768	348	1022	-254	-746
Unit 2	1749	4186	831	1993	-918	-2193
Great River Energy - Stanton Station						
Unit 1	2310	7176	2456	7629	146	453
Unit 10	n/a	n/a	320	1107	320	1107
Gas Processing Plants						
Grasslands	n/a	n/a	273	n/a	273	n/a

Source	Base Year Emissions		Current Year Emissions		Increment Consuming Emissions[1]	
	24-hr[2] [lb/hr]	annual [TPY]	24-hr[3] [lb/hr]	annual [TPY]	24-hour [lb/hr]	annual [TPY]
Little Knife	n/a	n/a	427	n/a	427	n/a
Coal Gasification Plant						
Greatplain Synfuels	n/a	n/a	3323	n/a	3323	n/a
TOTAL	**21072**	**72840**	**52525**	**164277**	**31453**	**91538**

[1] Negative numbers indicate increment expanding emissions.

[2] Annual numbers are based on the Annual Emission Inventory Reports from 1976-1977 (e.g., *avg* S, annual coal use) and AP-42 emission factors. 24-hr numbers are based on the ratio of the annual average emission rate (from 1999-2000 CEM data) to the 90th percentile 24-hr emission rate (from 1999-2000 CEM data) applied to the annual average emission rate in the base year.

[3] Based on the 90th percentile of the 24-hr average from 1999 and 2000 CEM data.

[4] Based on 2000 CEM data only.

[5] Unit 2 had only been operating 9 months as of the minor source baseline date (12/19/77) and those 9 months were not considered representative of actual operation. Therefore, allowable emissions were used to determine baseline emissions. See 45 FR 52718, col 3.

[6] Current year emissions based on 2000 CEM data only. Unit 1 does not report to the Acid Rain Database; hourly CEM data were only available for 2000 from the State.

Table 3-5

SO_2 INCREMENT CONSUMING EMISSIONS FOR MONTANA CLASS I AREAS

Source	BaseYear Emissions		Current Year Emissions		Increment Consuming Emissions[1]	
	24-hr[2] [lb/hr]	annual [TPY]	24-hr[3] [lb/hr]	annual [TPY]	24-hour [lb/hr]	annual [TPY]
Basin Electric Power Cooperative - Antelope Valley Station						
Units 1+2	n/a	n/a	3598	14282	3598	14282
Otter Tail - Coyote Station						
Unit 1	n/a	n/a	5077	17281	5077	17381
Great River Energy - Coal Creek Station						
Unit 1[4]	n/a	n/a	4195	14332	4195	14332
Unit 2[4]	n/a	n/a	3552	12817	3552	12817
PPL Corp. - Colstrip (Montana)						
Unit 3	n/a	n/a	672	2945	672	2945

Source	Base Year Emissions		Current Year Emissions		Increment Consuming Emissions[1]	
	24-hr[2] [lb/hr]	annual [TPY]	24-hr[3] [lb/hr]	annual [TPY]	24-hour [lb/hr]	annual [TPY]
Unit 4	n/a	n/a	640	2804	640	2804
Minnkota Power Cooperative - Milton R.Young Station						
Unit 1	4208	14176	5575	18788	1367	4612
Unit 2[5]	4970	18092	6128	21499	1158	3407
Basin Electric Power Cooperative - Leland Olds Station						
Unit 1	3469	11869	4931	16833	1462	4964
Unit 2	6575	19999	10179	30947	3604	10948
Montana Dakota Utilities Co. - Heskett Station						
Unit 1[6]	590	1734	348	1022	-242	-712
Unit 2	1628	3895	831	1993	-797	-1902
Great River Energy - Stanton Station						
Unit 1	1989	6178	2456	7629	467	1451
Unit 10	n/a	n/a	320	1107	320	1107
Gas Processing Plants						
Grasslands	n/a	n/a	273	n/a	273	n/a
Little Knife	n/a	n/a	427	n/a	427	n/a
Coal Gasification Plant						
Greatplain Synfuels	n/a	n/a	3323	n/a	3323	n/a
TOTAL	**23429**	**75943**	**52525**	**164277**	**29096**	**88435**

[1] Negative numbers indicate increment expanding emissions.

[2] Annual numbers are based on the Annual Emission Inventory Reports from 1977-1978 (e.g., *avg* S, annual coal use) and AP-42 emission factors. 24-hr numbers are based on the ratio of the annual average emission rate (from 1999-2000 CEM data) to the 90th percentile 24-hr emission rate (from 1999-2000 CEM data) applied to the annual average emission rate in the base year.

[3] Based on the 90th percentile of the 24-hr average from 1999 and 2000 CEM data.

[4] Based on 2000 CEM data only.

[5] Unit 2 had only been operating 9 months in 1977 and those 9 months were not considered representative of actual operation. Therefore, allowable emissions were used to determine 1977 emissions. See 45 FR 52718, col. 3. 1978 emissions are based on an emission factor of 16.8 S for NSPS boilers (see AP-42, Table 1.7-2).

[6] Current year emissions based on 2000 CEM data only. Unit 1 does not report to the Acid Rain Database;

hourly CEM data were only available for 2000 from the State.

3.4 Increment Expanding Emissions

We modeled six major sources as increment-expanding sources. Montana Dakota Utilities Co's Heskett Station had a reduction in actual emissions since the minor source baseline dates (12/17/77 for North Dakota and 3/26/79 for Montana) and its emissions were therefore modeled as increment expanding. Five other sources in North Dakota shut down after the applicable minor source baseline dates (12/17/77 in North Dakota and 3/26/79 in Montana). These sources include the Amerada Hess Tioga Gas Plant, Basin Electric Power Cooperative's Neal Station (Units 1 and 2), Flying J Inc.'s Williston Refinery, Montana-Dakota Utilities Co.'s Beulah Station (Units 1-2 and 3-5), and the Royal Oak Briquetting Plant (Units 1, 2 and 3).

For the five sources that shut down since the minor source baseline dates, we modeled the same emission rates the NDDH used in their 1999 draft analysis and outlined in Table 3.4-1.

Table 3-6
SO_2 INCREMENT EXPANDING EMISSIONS

Source	Increment Expanding Emissions	
	ND modeled annual [g/s]	annual [TPY]
Basin Electric Power Coop. - Neal Station	37.4	1301.5
Montana-Dakota Utilities Co. - Beulah Station	78.2	2721.4
Flying J Inc. - Williston Refinery	5.7	198.4
Amerada Hess Tioga Gas Plant	62.9	2188.9
Royal Oak Briquetting Plant	68.9	2397.7
TOTAL	**253**	**8808**

4. Results

The Calpuff modeling results are shown in Tables 4-1 through 4-5. To determine PSD compliance these modeled results are compared with the applicable Class I increments.

The PSD increments for SO_2 are specified in section 163(b) of the Act. For Class I areas, those increments are:

annual arithmetic mean...............2 $\mu g/m^3$
twenty-four hour average...........5 $\mu g/m^3$
three hour average....................25 $\mu g/m^3$.

For any averaging period other than an annual averaging period, section 163(a) of the Act allows the increment to be exceeded during one such period per year. Otherwise, section 163 of the Act provides that the increments are not to be exceeded and that the State Implementation Plan must contain measures assuring that the increments will not be exceeded in the future. In the following tables, the number of exceedances indicates the number of times in each year that Calpuff predicted concentrations exceeding the applicable increment. Any number larger than one indicates a violation of the Class I increment.

Table 4-1. Calpuff Class I Increment Results
TRNP-South Unit
($\mu g/m^3$)

	1990	1991	1992	1993	1994
3-hr Predictions					
Highest	36.4	31.4	25.6	35.0	29.9
High, 2nd High	31.4	30.0	< 25	25.1	< 25
Max # of Exceedances	4	2	1	2	0
24-hr Predictions					
Highest	14.1	15.3	6.9	8.5	10.1
High, 2nd High	12.8	8.5	5.4	7.3	7.7
Max # of Exceedances	8	7	2	5	10

Table 4-2. Calpuff Class I Increment Results
TRNP-North Unit
($\mu g/m^3$)

	1990	1991	1992	1993	1994
3-hr Predictions					
Highest	29.4	30.7	33.8	32.3	32.0
High, 2nd High	29.0	28.5	27.7	< 25	31.4
Max # of Exceedances	2	2	3	1	2
24-hr Predictions					
Highest	12.3	11.9	12.1	13.1	13.4
High, 2nd High	10.5	9.2	7.0	7.9	9.6
Max # of Exceedances	9	7	6	8	7

Table 4-3. Calpuff Class I Increment Results
TRNP- Elkhorn Unit
($\mu g/m^3$)

	1990	1991	1992	1993	1994
3-hr Predictions					
Highest	< 25	< 25	< 25	25.8	35.7
High, 2nd High	< 25	< 25	< 25	< 25	< 25
Max # of Exceedances	0	0	0	1	1
24-hr Predictions					
Highest	9.4	11.5	< 5	6.5	11.9
High, 2nd High	6.9	7.1	< 5	6.4	11.4
Max # of Exceedances	5	6	0	5	6

Table 4-4. Calpuff Class I Increment Results
Lostwood Wilderness Area
($\mu g/m^3$)

	1990	1991	1992	1993	1994
3-hr Predictions					
Highest	< 25	< 25	31.5	< 25	25.6
High, 2nd High	< 25	< 25	< 25	< 25	< 25
Max # of Exceedances	0	0	1	0	1
24-hr Predictions					
Highest	7.6	9.1	8.9	5.9	6.4
High, 2nd High	6.6	6.8	7.7	5.5	6.4
Max # of Exceedances	7	10	8	4	7

Table 4-7
Calpuff Class I SO_2 PSD Increment Results
Summary of 5-year Maximum Values (1990-1994)
($\mu g/m^3$)

	TRNP South	TRNP North	TRNP Elkhorn R.	Lostwood Wilderness	Med. Lake Wilderness	Ft. Peck Reservation
3-hr Predictions						
Highest	36.4	32.3	35.7	31.5	26.0	27.9
High, 2nd High	31.4	31.4	< 25	< 25	25.9	< 25
Max # of Exceedances	4	3	1	1	2	1
24-hr Predictions						
Highest	15.3	13.4	11.9	9.1	8.0	11.8
High, 2nd High	12.8	10.5	11.4	7.7	5.9	6.3
Max # of Exceedances	10	9	6	10	3	3

4.1 Results Using Regulatory Default Input Values

EPA conducted a sensitivity test to show the difference in predicted concentrations compared to a regulatory default application of the Calmet and Calpuff models. With the exception of directly monitored North Dakota values (e.g. mixing height, O_3/ NH_3 background concentrations, etc.), all IWAQM recommendations were selected, and the unrevised EPA regulatory version of the model was used. The results of this test run are shown in Table 4.1-1. From the table it can be seen that the regulatory default selections result in higher predicted concentrations than the selections used in the current study. Non-IWAQM parameters related to the method of dispersion (MDISP, MPDF) were responsible for a large portion of the observed differences. EPA based its selection of non-IWAQM settings largely on the NDDH testing of the model. In these tests Calpuff/Calmet model predictions were compared with observed concentrations for two SO_2 monitoring sites located in and near the Theodore Roosevelt National Park located in western North Dakota. The evaluation was limited by the lack of representative monitoring sites so that a full evaluation using American Meteorological Society performance statistics could not be generated, and predictions/observations were not paired in time. Given the relatively sparse set of SO_2 monitoring data that has been used in testing the model, EPA solicits public comment on which default values should be used in the final modeling to complete the current study.

Table 4-8
Calpuff PSD Increment Analysis
Comparing Modeling Results Using Regulatory Defaults (bold) and Locally Developed Input Settings.

1990 Modeling Results	**TRNP South**	**TRNP North**	**TRNP Elkhorn R.**	**Lostwood Wilderness**	**Med. Lake Wilderness**	**Ft. Peck Reservation**
3-hr Predictions						
Highest	**61.5** /36.4	**35.1** /29.4	**27.5** /< 25	**31.2** /< 25		
High, 2nd High	**45.1** /31.4	**33.1** /29.0	**25.8** /< 25	**< 25** /< 25		
Max # of Exceedances	**12** /4	**9** /2	**2** /0	**1** /0		
24-hr Predictions						
Highest	**22.4** /14.1	**15.2** /12.3	**8.8** /9.4	**8.4** /7.6		
High, 2nd High	**18.6** /12.8	**13.8** /10.5	**8.4** /6.9	**7.7** /6.6		
Max # of Exceedances	**16** /8	**14** /9	**6** /5	**9** /7		